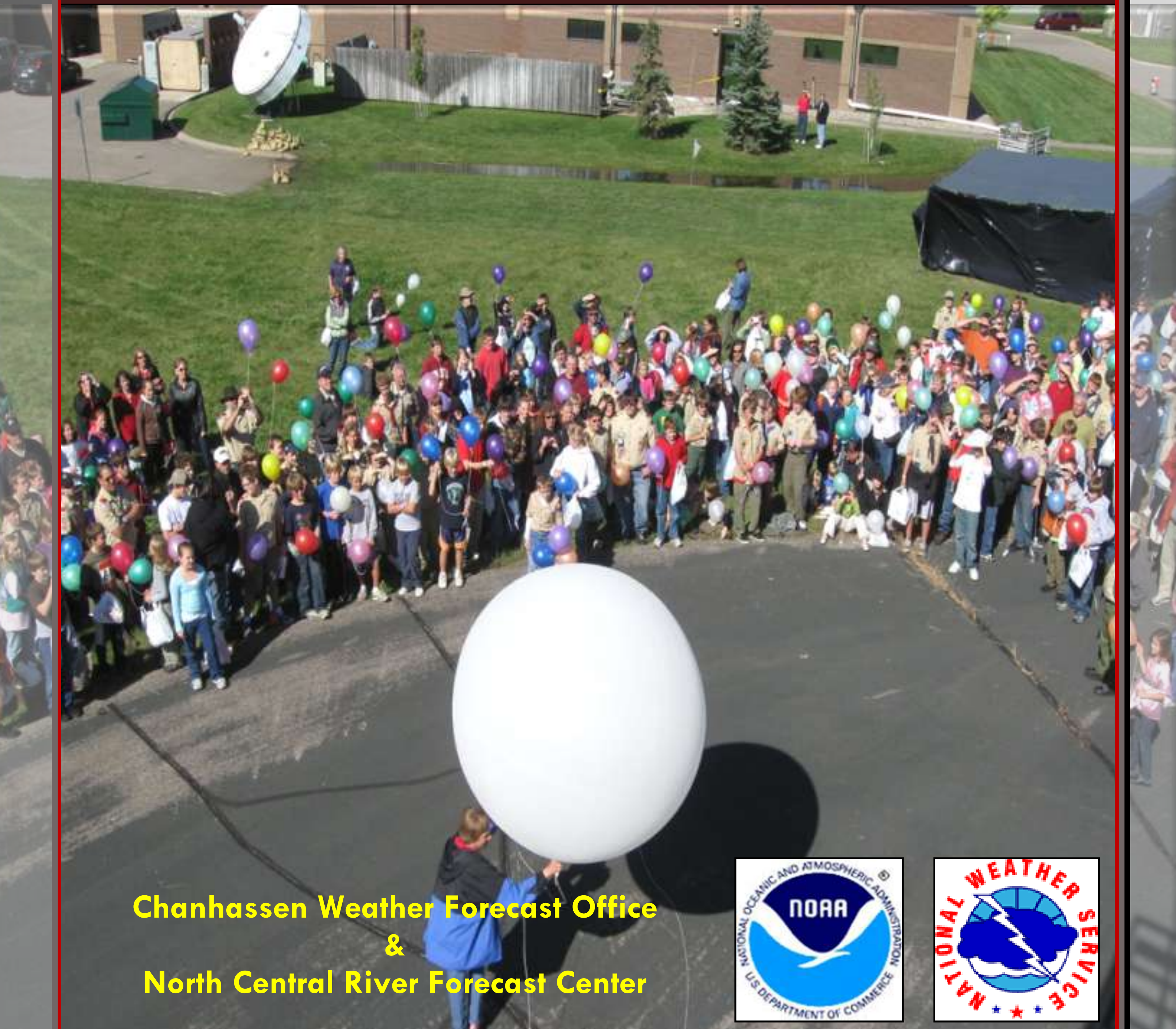
NWS Chanhassen Shareholders' Report 2008



Chanhassen Weather Forecast Office
&
North Central River Forecast Center

Preface

"My vision for the National Weather Service Chanhassen Water and Weather Forecasting Office is to provide the very best in customer service and information to our diverse customer base. Today's climate, water and weather information needs continue to grow, and we can expect this to continue as customer's expectations increase and science and technology advance. We have some of the brightest, most energetic, and capable meteorologists and hydrologists. There are service and information opportunities that we will continue to embrace. Our goal is to focus on high impact events that significantly impact our customers and to provide decision support services to aid our partners. On April 1, 2009, the Minnesota and Wisconsin National Weather Service offices transitioned to one inch hail criteria for the issuance of a severe thunderstorm warning. We believe this will provide much better service and raise the credibility in our severe thunderstorm warnings.

This report details the climate, water, and weather activities and events of the NWS office in Chanhassen in 2008. Since you are a customer, I hope you find our activities demonstrate the sort of stewardship you expect from your public servants. I welcome your comments and suggestions as to how we can improve our services and information."

- ***Dan Luna***
Meteorologist in Charge - Weather Forecast Office

- ***Scott Dummer***
Hydrologist in Charge - River Forecast Office

Our Office Mission

"We are dedicated to providing high quality and timely warnings, forecasts, and other hydrometeorological services to ensure public safety and to benefit the people we serve."

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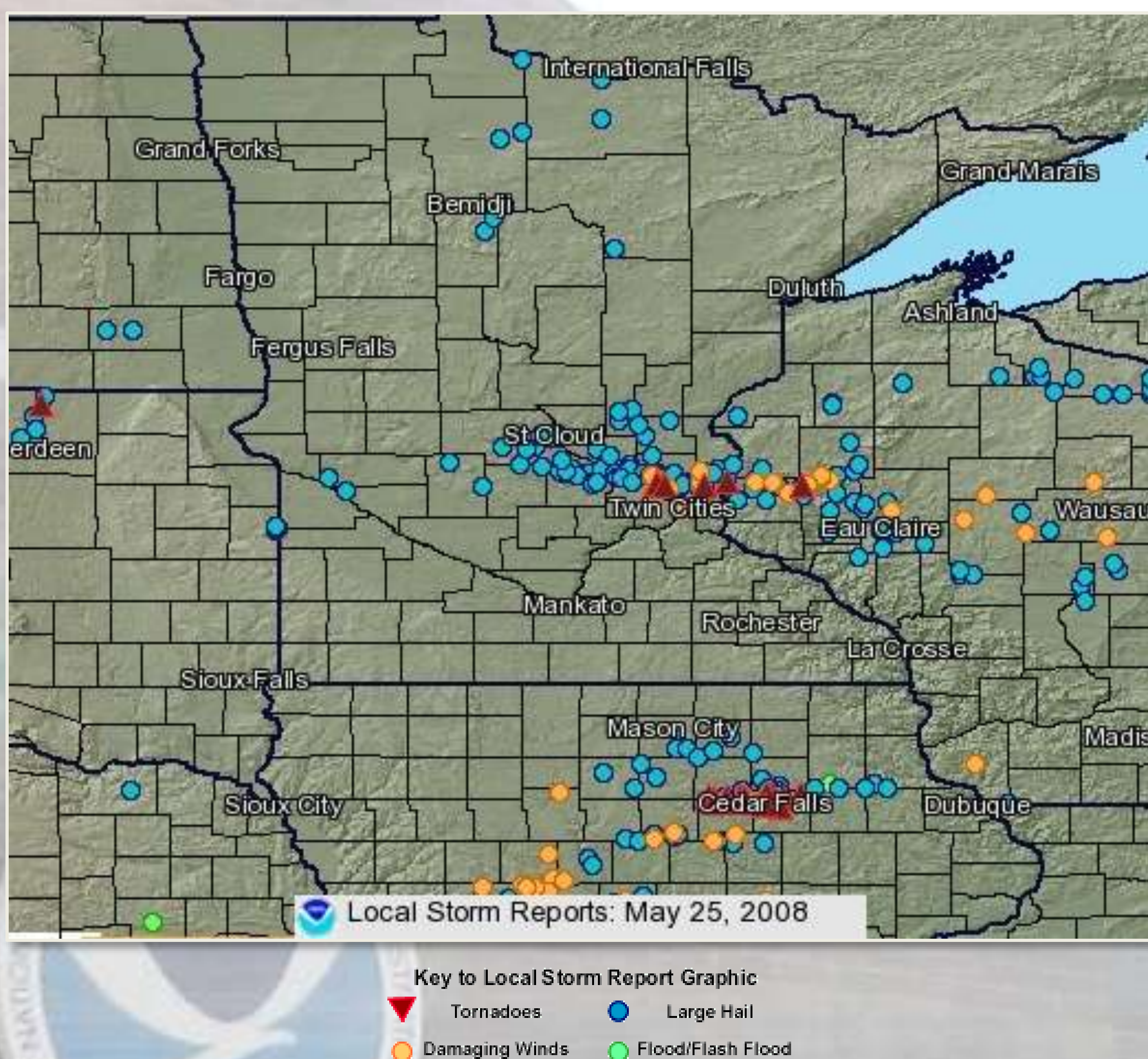
Common Acronyms
NWS: National Weather Service
RFC: River Forecast Center
WFO: Weather Forecast Office

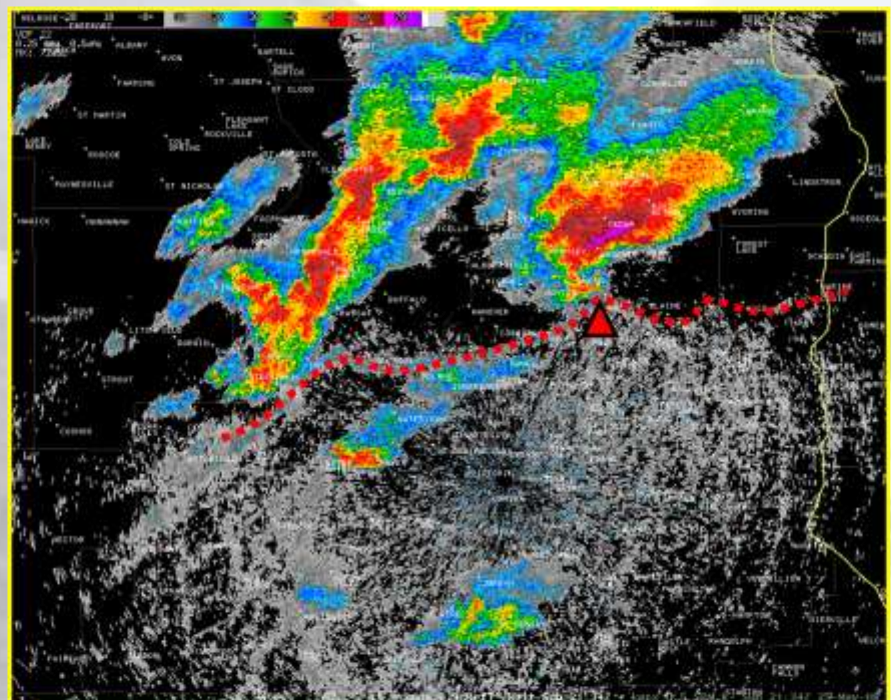
Hugo, MN EF-3 Tornado

Severe thunderstorms impacted much of central Minnesota and west central Wisconsin on May 25, 2008. One particularly intense supercell thunderstorm resulted in several tornado touchdowns along its path, and sadly one fatality in the city of Hugo, MN. This storm also produced very large hail, up to softball size in diameter as it moved through the northern suburbs of the Twin Cities metro area. The atmosphere was primed for severe weather during the afternoon and early evening owing to abundant instability and wind shear. The presence of a warm frontal boundary in the northern Twin Cities metro area helped focus a number of atmospheric ingredients, setting the stage for tornadic development as the intense supercell tracked across the area.



Numerous severe thunderstorm and tornado warnings were issued during the afternoon and early evening of 25 May 2008. Below is a brief summary of tornado warnings associated with the deadly tornadic storm which produced touchdowns in Coon Rapids, Lino Lakes, and Hugo in the north metro area of the Twin Cities.

- 3:49 PM CDT: Tornado Warning issued until 4:15 PM CDT for south central Sherburne and northern Wright counties, including Silver Creek, Monticello, Big Lake, Otsego, and Maple Lake. There were no tornadoes during this time, but numerous reports of large hail.
- 4:03 PM CDT: Tornado Warning issued until 4:30 PM CDT for east central Wright and northern Hennepin counties, including Rockford, Greenfield, Albertville, St. Michael, Hanover, Corcoran, Rogers, Hamel, Dayton, and Maple Grove. The storm continued to generate very large hail during this time frame, but did not produce any tornadoes.
- 4:37 PM CDT: Tornado Warning issued until 5:00 PM CDT for southern Anoka, northwestern Washington, and northeastern Ramsey counties, including Coon Rapids, Oak Park, Ham Lake, Blaine, Lexington, Circle Pines, Lino Lakes, North Oaks, Centerville, Forest Lake, and Hugo. It was during this time period when tornadoes touched down near Coon Rapids (4:35-4:47 PM CDT), Lino Lakes (4:55-4:58 PM CDT), and Hugo (4:58-5:05 PM CDT).
- 4:58 PM CDT: Tornado Warning issued until 5:30 PM CDT for southeastern Anoka, northern Washington, and extreme northeastern Ramsey counties, including Lino Lakes, Hugo, Forest Lake, Centerville, and Scandia. This was the second warning issued for the Hugo area, and extended the warning eastward.



The storm which was responsible for the tornadoes exhibited classic supercell structure in radar imagery, with a strong mid-level circulation, bounded weak echo region, and a low level hook echo feature. However, during much of its lifetime it mainly produced large hail, with tornadoes occurring only when it was in very close proximity to the warm frontal boundary. This behavior was likely due to a number of factors, most notably the increased low-level moisture, convergence, and wind shear/spin in the proximity of the boundary. Determining which severe thunderstorms will produce tornadoes remains a significant challenge to meteorologists due to the complexity of the atmosphere. It is hoped that additional research, such as that undertaken by the Vortex II project in the spring of 2009, will help meteorologists to continue improving in the accuracy of tornado warnings.

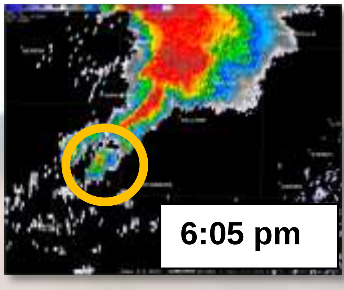
Willmar, MN EF-3 Tornado

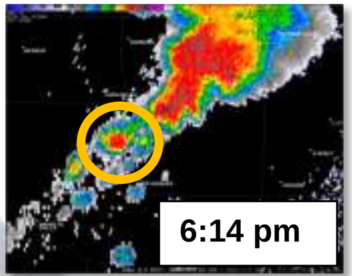
Like Hugo and Park Rapids earlier in the 2008 summer, the area immediately south of Willmar would be the next in Minnesota to be struck by a powerful tornado on July 11th. This EF-3 tornado destroyed several structures and caused two injuries, but thankfully no fatalities. This storm was not of the stereotypical nature of producing a strong tornado, developing extremely rapidly. Because of this, reports from Skywarn Storm Spotters in the field proved vital that day to the tornado warning process. The WFO Chanhassen would also research this event through the months afterwards from a science and service perspective, presenting findings on this quick developing tornado at various conferences.

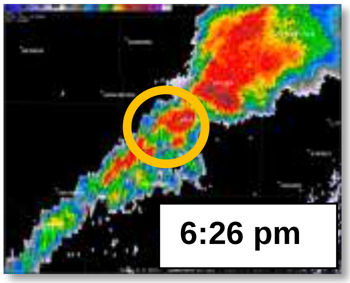
Pictures courtesy of various storm spotters and public

The weather pattern on July 11th was one conducive for severe thunderstorms, including tornadoes. A strong cold front at the surface was moving east into the state by late afternoon on that day, which correlated to just after the maximum heating. Temperatures ahead of the front had warmed into the lower to mid 90s, with Willmar reaching 91°. The air mass was not only warm but also rich with moisture. This combination produced large instability, which thunderstorms not only fuel on to develop but to become severe. Increasing and turning wind speeds with height were also present, a condition that can aid in tornado development.

Near 6:05 pm, the storm which would end up producing the tornado began to develop about twenty miles west southwest of Willmar. The below images show approximate 10 minute time steps in the storm's evolution. Relative to the severe storms further northeast, the storm of interest did not look particularly intense at first. But by 6:26 pm, the radar reflectivity showed a hook-like appearance, a signature reflective of potential rotation. Doppler radar velocity fields also indicated that rotation quickly developed between radar scans and was visible at 6:26 pm.







While meteorologists in our office were observing these radar trends, further information was coming into our office about the storm from the eyes and ears of the NWS during severe weather: Skywarn storm spotters. In that portion of Minnesota, these spotters were activated at 2:30 pm when a tornado watch was issued, which indicated an environment favorable for tornadoes. When the storm near Willmar increased in intensity, Skywarn spotters relayed their observations in real time through ham radio of a developing tornado six miles southwest of Willmar. This was just prior to the radar revealing strong rotation, indicating how quickly developing this storm was. Knowing what they did about the environment that day, NWS meteorologists acted on these spotter reports and issued a tornado warning for this storm. Spotters stayed with the storm, watching the tornado through its lifecycle with continual relay of tornado positioning, appearance, and other characteristics.

The tornado path and associated damage was surveyed the day after by a team from the WFO. Estimated wind speeds were in the 136-150 mph range, or in the low to middle end of the three category on the Enhanced-Fujita (EF) tornado rating scale. The path length was near eight miles, with the touchdown six miles southwest of Willmar and the dissipation about four and a half miles south southeast of Willmar. Multiple structures were damaged or destroyed, including several homes. In some of these were people whom had taken cover in the basement and survived the tornado. Surveying tornado damage is an essential part in the severe weather process by the NWS. It allows us to correlate what damage happened with what was seen on radar and more importantly offers us the chance to talk with survivors.

Local WFO research after the event revealed that several subtle environmental features in tandem likely played a role in the tornado's rapid development and then its subsequent track. These include a small scale low pressure system (on the county scale) moving with the thunderstorms, possible interaction between thunderstorms, and even a cloud anvil shadow creating a meso-front or boundary which tornadoes can favor for development and/or tracking along. Following events with post-mortem write-ups or studies are something that the WFO in Chanhassen strives to do after every tornado event.

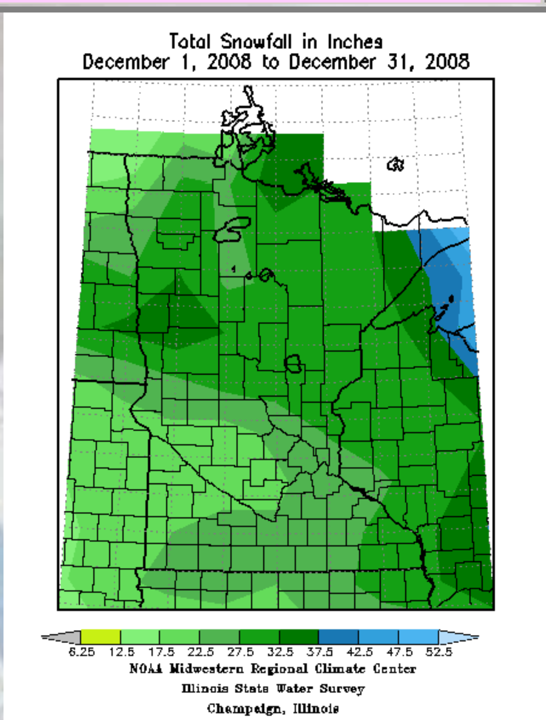
Snowy December

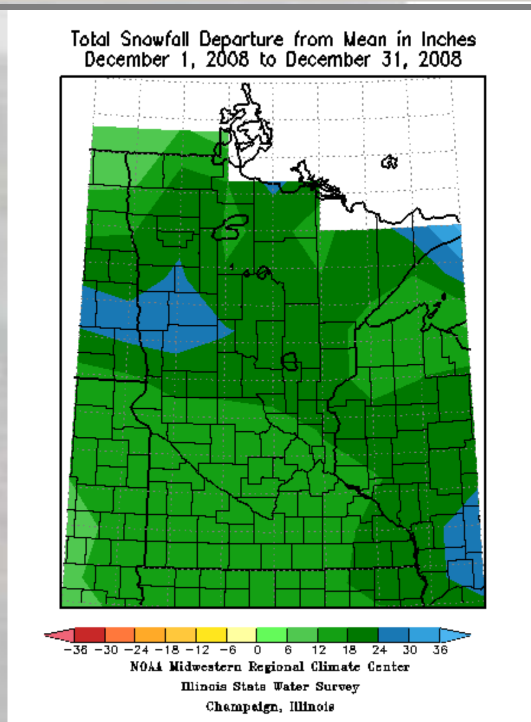
For snow enthusiasts, the December of 2008 was ideal. Monthly snowfall totals between 17 and 25 inches were common across the Twin Cities forecast area. This crushed the average value of around ten inches for most locations. Several sites across the area finished in the rankings for the top ten snowiest Decembers, including St. Cloud and Eau Claire. The tables and graphics below illustrate the notable increase in snowfall that occurred across much of the area during the past December.

Top 10 Snowiest Decembers in St. Cloud (STC)		
Rank	**Amount (in)**	**Year**
1	25.5	1927
2	25.4	1968
3	25.0	1969
4	**23.0**	**2008**
5	21.8	1950
6	19.0	1936
7	18.0	1945
8	17.8	1978
9	16.3	1981
10	16.2	2000

Top 10 Snowiest Decembers in Eau Claire (EAU)		
Rank	**Amount (in)**	**Year**
1	31.4	1968
2	25.4	1996
3	25.3	1972
4	**25.0**	**2008**
5	24.2	1969
6	23.6	2000
7	22.8	1950
8	22.0	2007
9	21.7	1977
10	19.2	1984

Snowfall Graphics for December 2008	
Total Snowfall	**Deviation From Normal**





Even more unique than the snowfall amounts during the month of December, was the frequency of snowfall. A very active jet stream pattern brought a parade of weather systems across the central United States. The lively pattern combined with the presence of a persistent arctic air mass in place across the Upper Midwest to produce measurable snowfall every couple of days.

Number of Days with certain thresholds of snowfall in December 2008			
Location	**Days with a dusting (trace) or more**	**Days with 0.5 inch or greater**	**Days with 1 inch or more**
Minneapolis	**23**	**8**	**6 (average = 3.3)**
Chanhassen (NWS office)	**24**	**9**	**7**
St. Cloud	**20**	**8**	**7 (average = 3.2)**
Eau Claire	**27**	**13**	**11 (average = 3.7)**

From a service aspect, WFO Chanhassen had winter storm watches, warnings and/or advisories in effect on twenty-two out of thirty-one days during the month of December! Our website also enjoyed a tremendous increase to over four and a quarter million hits during the month of December. This total for December alone exceeded the number of hits the WFO website experienced during August through November.

Training

"The production of accurate and effective forecasts and warnings requires the culmination of many efforts, both internal and external. The Warning Coordination Meteorologist (WCM) position serves a crucial role in this effort, and any advances in our science and training depend upon the tireless efforts of our WCM so that they manifest themselves in an improvement of our services to the public. Meteorology is a science, but like any science, it is one which is constantly thirsting for new knowledge and information. There remain many unknowns in the world of forecasting, and one of our jobs as meteorologists is to continually solve problems while raising new questions to cast further light into other areas of our understanding. It is my hope that our office will continue its research into atmospheric phenomena, particularly those which relate to forecast and warning challenges across our area. Things we learn from such research should be incorporated into our thought processes when producing forecasts and warnings. To ensure that occurs, it is necessary that adequate, timely, and appropriate training be conducted routinely. Training should not be thought of as a periodic refresher on old information or primer on new tools, but rather an ongoing learning experience. As scientists we should all relish the opportunity to learn new things and challenge things we thought we already knew, and the application of this knowledge in producing better forecasts and warnings should inspire all of us to continue to learn throughout our careers."

- *Tom Hultquist*
Science and Operations Officer
Weather Forecast Office

Office Wide Training Reviews in 2008
Weather Forecast Office
Spring Severe Weather Workshop
Spring Severe Weather Case Review
Winter Weather Workshop
Winter Weather Case Review
Ten Computer-Based Modules

Regional or National Non-NWS Conferences or Workshops Attended by WFO Staff
January: American Meteorological Society Annual Meeting in New Orleans, LA (1)
February: Flash Flood Workshop in Boulder, CO (1)
April: Northern Plains Convective Workshop in Bismarck, ND (4)
April: Minnesota Skywarn Conference in Minneapolis, MN (3)
September: Northern Plains Winter Storms Conference in St. Cloud, MN (3)
October: U.S./Canada Great Lakes Opeartional Meteorology Workshop in Ann Arbor, MI (1)
October: NWA Annual Meeting in Louisville, KY (1)
October: American Meteorological Society Severe Local Storms Conference in Savannah, GA (1)
December: Environmental Modeling Center Product Suite Review Meeting in Silver Springs, MD (1)

Outreach

As a scientific *service* agency, the NWS in Chanhassen proudly conducts dozens of outreach events with our partners and for the public each year. These include safety and school talks, display booths at expos, and more. Once again in 2008, the largest two outreaches were two that have become annual traditions for the NWS office in Chanhassen. These were an interactive booth at the Government on Display at the Mall of America in January and at the Minnesota State Fair for a dozen days in late August and early September. Both of these outreach events offer our office exposure to tens of thousands of people. These are unique opportunities for NWS offices that we have enjoyed and look forward to participating in annually.

Notable Outreach Events in 2008
Minnesota State Fair in Falcon Heights, MN
Government on Display at the Mall of America in Bloomington, MN
Scout Day at the Office in Chanhassen, MN
Four Elementary Age Safety Camps
Nine School Presentations (Weather Safety, Career, or Weather Education)
Three Fire Department Open Houses

NWS Chanhassen 2008 Tours

Private or Public School Groups: 7	**Family Tours: 4**
Home School Groups: 2	**Young Adults with Special Needs Groups: 2**
University of Minnesota Groups: 4	**Shadow Students: 6**
HAM Radio Groups: 1	**Law Enforcement Group: 1**

Aviation Services

One of the goals for the aviation program in 2008 was to increase the awareness of the aviation weather services provided by the National Weather Service and increase our own awareness of the needs and functions of the aviation community through outreach activities. Several presentations were put together in a joint effort by WFO and Center Weather Service Unit (CWSU) staff that focused on weather safety for aircraft operations and resources available to the aviation community to help their flight planning and promote weather safety. WFO and CWSU staff were able to speak to Civil Air Patrol wings, an Experimental Aircraft Association (EAA) chapter, and at several FAA Safety Team meetings. A brochure was also created to highlight the aviation weather services provided locally and nationally. This brochure was distributed at the Minnesota State Fair, at an EAA fly-in at Lake Elmo Airport, and at other outreach functions. We expect to visit each of the Terminal Aerodrome Forecast (TAF) airports and some of the busier MSP satellite airports in later 2009. We are also looking forward to requests from groups such as the Civil Air Patrol, EAA, balloonists, and soaring aviators in learning more about weather and flying and about the service we provide.

The Twin Cities/Chanhassen aviation weather web page saw some enhancements in 2008. Ceiling, visibility, and wind climatology graphics were developed for each TAF airport in the CWA. These graphs show the distribution of the various flight categories by hour for each month of the year. A wind rose is also available which shows the distribution of wind speed and direction over the course of each month. Links to Tactical Decision Aids (TDA) for each TAF airport were also added. These TDA's are a visual means of viewing the weather information included in a TAF.

Forecast verification is an important part to the aviation forecast program. As forecasters, we need to monitor our performance in order to see where we have made improvements or where further improvements need to be made. It's an ongoing process. Efforts were made throughout 2008 to analyze the TAF performance during significant aviation weather events such as extended periods of IFR (Instrument Flight Rules) conditions, thunderstorms, and winter storms. This is in addition to routine monthly forecast verification. Looking at specific events allows near real-time feedback to forecasters who worked the event, which allows the event to be fresh in their minds and provides insight to other forecasters who may experience similar events in the near future. Efforts were made to talk with users of aviation weather forecasts, such as FAA air traffic managers, to determine what impacts the weather conditions and the forecast had on their operations. Not only do forecasters see how their forecasts played out but they can get a feel for how users of the information were affected which can give them a better understanding of the importance of the weather information they are providing. This event based verification can also help build knowledge of typical conditions that occur with various types of weather setups which can be drawn upon at a later date when a similar setup is expected.

WSR-88D Doppler Radar

In the 2008 shareholders report, it was indicated that the Chanhassen Doppler radar would have an upgrade to "Super Resolution" data. This upgrade took place in early April 2008. This changed the azimuth resolution, or gate spacing of the radar data, from 1 degree to 0.5 degrees. It also changed the reflectivity data range resolution from 1 km to 250 meters.

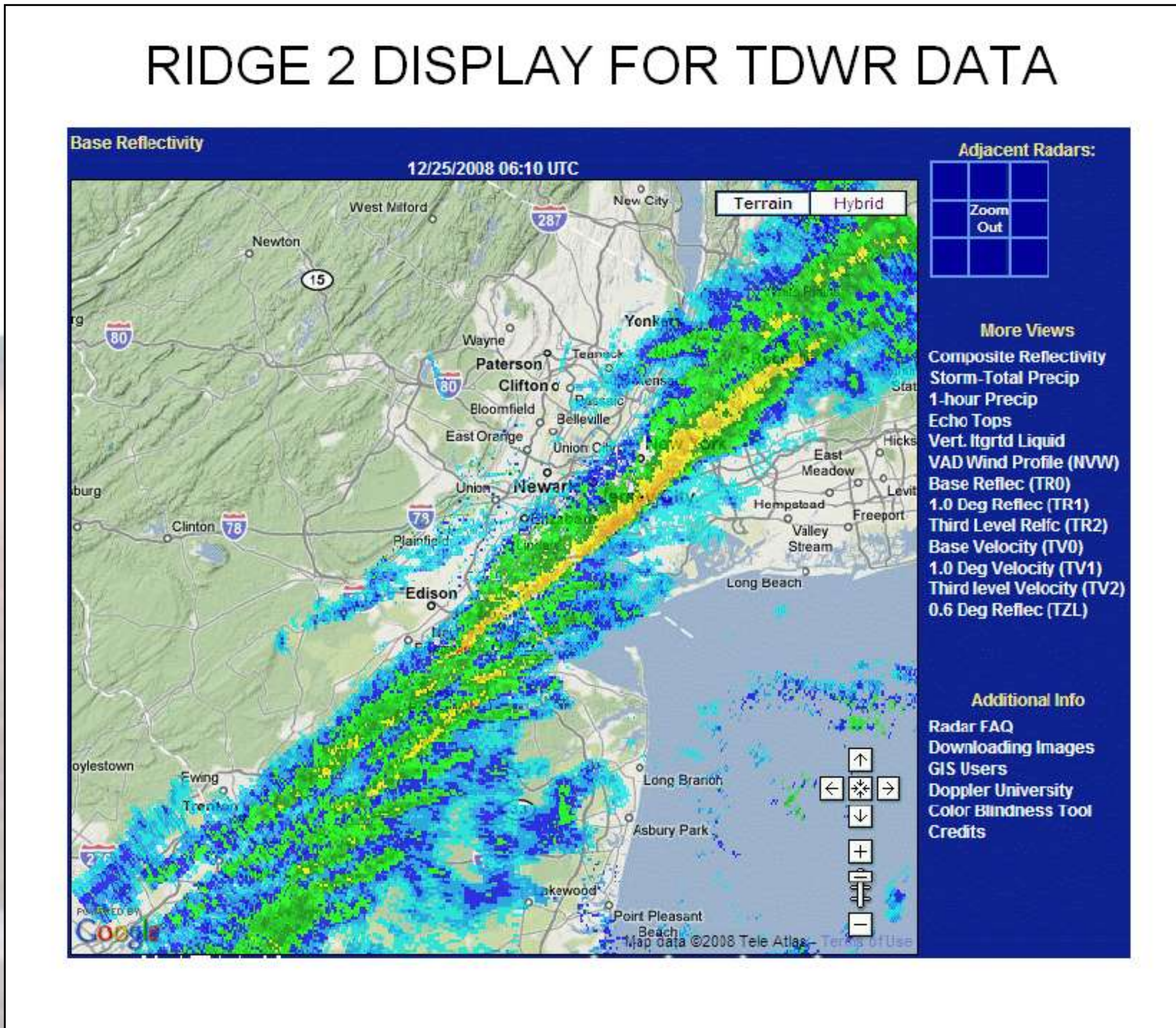
We also began receiving radar data from the Minneapolis/St. Paul FAA Terminal Doppler Weather Radar (MSP TDWR) in the middle of April 2008. The MSP TDWR is located in southern Washington County, about 2 miles south of Woodbury. This places the radar approximately 14 miles to the east of the MSP airport and about 30 miles to the east of the Chanhassen WSR-88D radar.

The MSP TDWR is somewhat similar to the WSR-88D, but there are some notable differences. For one, since the MSP TDWR is used for weather surveillance near the MSP airport, the radar has scanning strategies that are optimized to detect wind shear and downburst signatures. Because of this, there are more frequent scans near ground level from the TDWR over the WSR-88D. The range on the lowest scan is 55 miles while the range on the lowest scan for the WSR-88D is 285 miles).

Although the range is somewhat limited on the lowest scan of the MSP TDWR, it offers the National Weather Service in Chanhassen another view of the Twin Cities metropolitan area. In addition, the lowest scan from the MSP TDWR is in 1 minute increments in precipitation mode whereas the quickest scanning strategy of the WSR-88D is 4 minutes.

Currently, there are 45 TDWR's in the United States, most of them in the eastern half of the United States. Coming in the summer of 2009 will be the availability for users to see the TDWR data as it is demonstrated through the RIDGE 2 display. RIDGE stands for **R**adar **I**ntegrated **D**isplay with **G**eospatial **E**lements. You are currently using RIDGE when you view any NWS radar from a weather.gov site. The significance of RIDGE is that it allows the user to toggle on or off features such as Topography, Counties, Rivers, Highways, Cities, Warnings as well as the Legend.

Although the NWS has access to 1 minute data from the TDWR, the data displayed through RIDGE 2 will be at 6 minute increments due to bandwidth considerations.



Example of what the RIDGE 2 display will look like for the TDWR

We had Super Resolution data and the MSP TDWR for only a little over a month when a significant severe weather event occurred in our forecast area. This event was on May 25th with a tornado passing through the northern suburbs of the Twin Cities, including Coon Rapids and Hugo, as well as adjoining areas of west central Wisconsin, including rural east Farmington and near Connersville.

We had the opportunity to use both data sets on that day. The first image below is from the Chanhassen WSR-88D radar, valid at 438 pm CST. This image demonstrates the Super Resolution data showing a well defined hook echo near Coon Rapids.

The second image shown is from the MSP TDWR, just one minute later at 439 pm CST. Although the WSR-88D image is zoomed in some compared to the TDWR, you should be able to see the Super Resolution data compared to the TDWR.

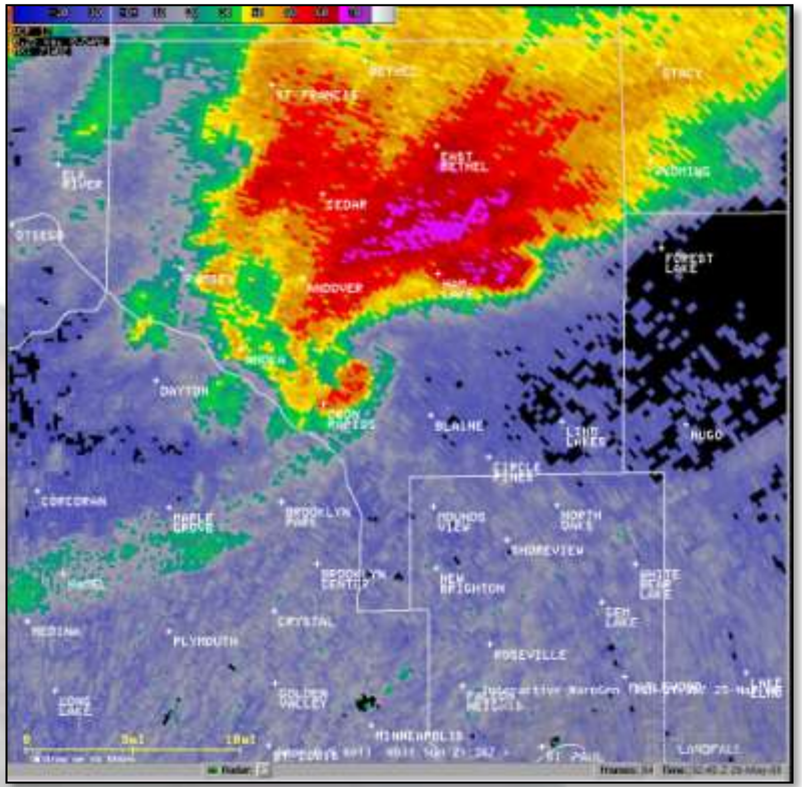


Image 1 (WSR-88D)

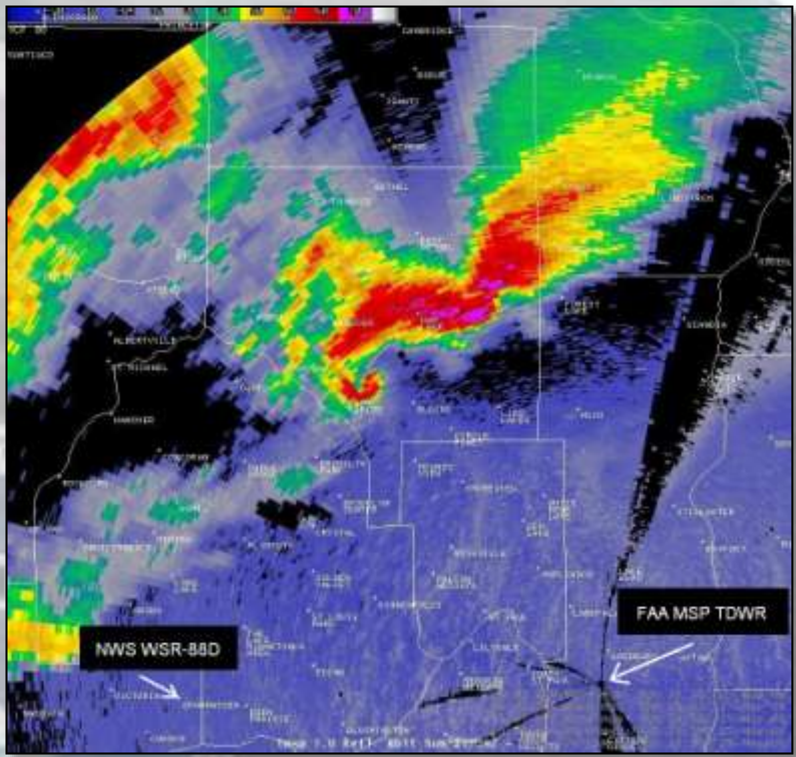


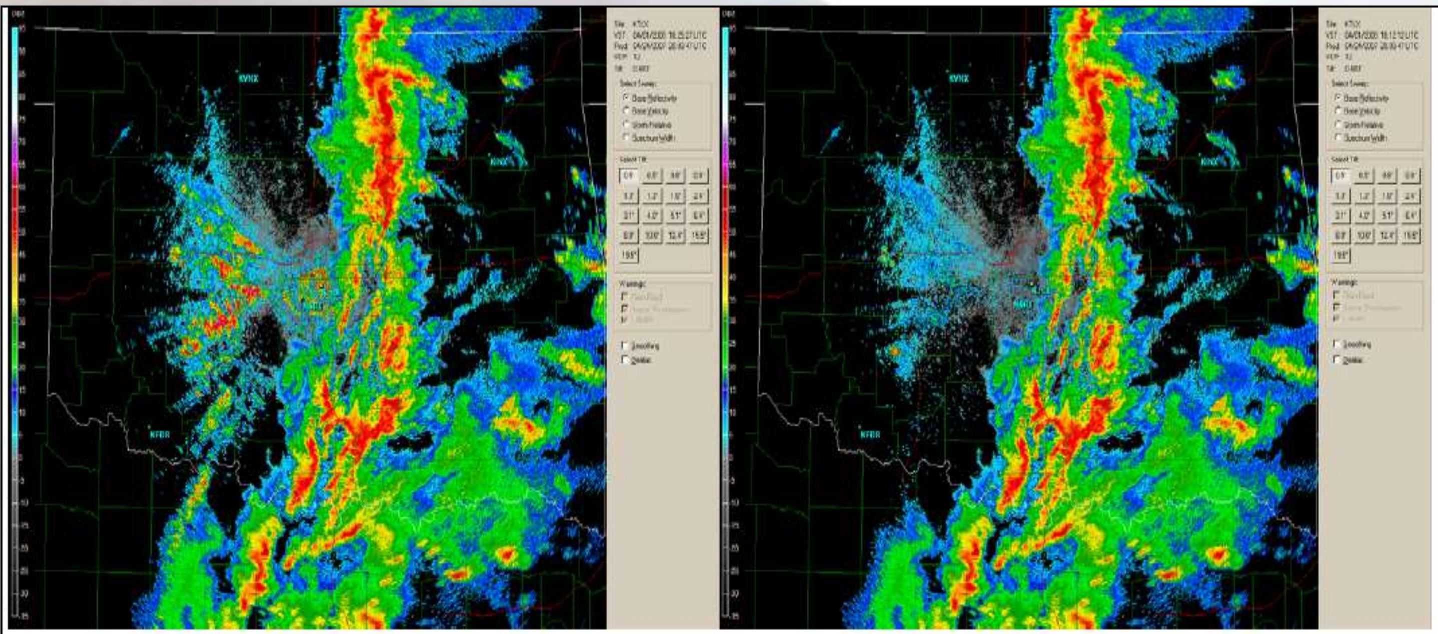
Image 2 (TDWR)

So you ask, "What's new for 2009?" There will a radar build that will deliver the Clutter Mitigation Decision algorithm (CMD). This new feature will apply clutter suppression automatically on a scan by scan, bin by bin basis.

Currently, we manually apply clutter suppression to all range bins or to certain sectors. There are problems with both techniques. You don't want clutter suppression applied to good radar echoes, and if you use the sector method, you have to keep checking to make sure your sector covers the bad data or Anomalous Propagation (AP).

AP develops when the radar beam is bent down to the earth's surface due to temperature and moisture discontinuities in the atmosphere. This is also known as ducting and occurs frequently behind thunderstorms and during the early morning hours when strong inversions are present.

Shown below is a radar example without the CMD and one with the CMD. Notice how the false echoes west of the radar (to the left of center) are greatly diminished when the Clutter Mitigation Decision algorithm is in use.

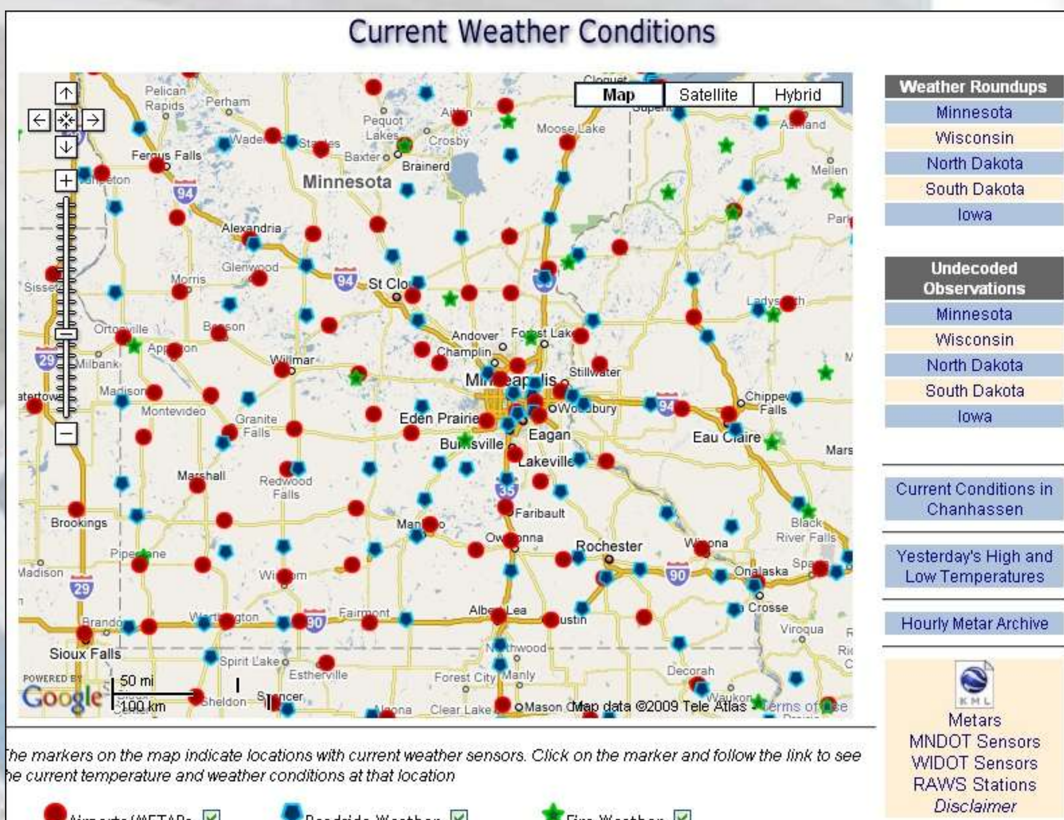


No CMD filtering

CMD controlled filtering

Web Service

Web site improvements for more efficient public use continued to be made regionally and locally to our web pages. A substantial partnership was made in 2008 between the NWS and Google for maps used on NWS web pages. Interactive background maps from Google will now be viewable on all "point and click" forecast pages, such as seen to the right. This allow a user to quickly and smoothly readjust where they want detailed forecast data for. Locally at WFO Chanhassen, an observational data web page has been made using the Google Earth resources (seen below). The map utilizes the overlay features of Google Maps, allowing a user to toggle on what type of observations they want to display. This is accessible by clicking on Observations in the left-hand blue column of the WFO home page.



Cooperative Observers

Cooperative Weather Observers are the backbone of the climate observing network. They record the daily weather conditions for over 110 locations across southern Minnesota and west central Wisconsin. These observers volunteer their time every day to note the weather in their community so the data can be archived at the local, state, and national level for future generations.

New Cooperative Observers	
Hamburg	Jordan
Kimball	New London

Their data allows everyone to know what the climate is like outside of the major metropolitan areas. It helps local officials and citizens know what kind of weather to expect in their local area year-round. Major decisions such as how to build roads and bridges, where to designate flood plains, how water resources are being managed, and planning for weather disaster mitigation are based on observations made by our dedicated Cooperative Weather Observers.

We also have several observers who have been a part of the observing program for many years. In 2008 we gave out 49 length of service awards to observers who have been volunteering for ten or more years. In addition, we gave awards to 21 institutions who have been taking weather observations for 25 years or more.

John Campanius Holm award winners Richard & Marlys Hjort from Forest Lake, MN. This award honors cooperative observers for outstanding accomplishments in the field of meteorological observations. It is named for a Lutheran minister, the first person known to have taken systematic weather observations in the American Colonies. Twenty-five Holm awards are given annually, and the recipients are nominated from a group of over 12,000 national cooperative network observers.

Skywarn Storm Spotters

Skywarn storm spotter continue their role as the eyes of the NWS during severe weather. In 2008, there were 702 documented events of severe weather in the WFO Chanhassen's County Warning Area, a majority of which were received from spotters. There were a total of 80 spotter training classes given in 2008, with approximately 2,860 new spotters. This brought the total number of spotters to over 9,000 in the County Warning Area. Of the 80 classes, WFO Chanhassen personnel taught about half of them. Skywarn spotters who have gone through the "train-the-trainers" course taught another 36 classes.

Spotters are required to take a training class taught by NWS personnel every other spring. In that course, they learn how to identify storms of interest, locations relative to a storm to observe from, and most important how to stay safe when in the field and near a potentially dangerous situation. Many spotters have their ham radio license, which is a means to contact the NWS directly along with relaying to other spotters.

The first Saturday in December is Skywarn Recognition Day, which is a day HAM radio operators make contacts across the country signifying the strength and importance of the Skywarn Storm spotters and the HAM radio network. We took part in this celebratory day again in 2008. The Chanhassen office made nearly 330 QSOs, or amateur radio contacts, within 46 states, including 41 other NWS offices. This was a sizeable increase from the number of contacts made in 2007.

As always, we sincerely thank our 9,000 plus local storm spotters for their continual efforts each year in helping the NWS severe weather warning and forecasting responsibility. You truly are the eyes of the NWS during severe weather.

An Upper Air Look

The upper air program moved to the WFO in Chanhassen in 1995 from its long time home at the St. Cloud Airport. It is perhaps surprising that upper air observations began in the late 1780's when scientists would take thermometers aloft in a balloon. By the late 1800's balloons had given way to kites, which were used for routine observations worldwide. In the early 1900's observing equipment had developed to the point where balloons could be used in place of kites.

Observations using balloons allow equipment to measure atmospheric conditions into the stratosphere. Early observations using balloons lifted recording instruments into the upper atmosphere recording the weather data. When the balloon broke, the instrument was parachuted to earth preserving the data until the instrument was located, which at times was impossible and the data was not available or used. This led to the use of airplanes from the mid 1920s into the 1940s. The NWS and the Army Air Corps operated about 20 aircraft sounding stations in the U.S. Again while this was useful, it had its drawbacks. For example, the altitude reached was relatively low, and the planes could not operate in poor weather. Additionally, the data was not available for analysis until the plane landed.

To understand the limitations of aircraft soundings, experiments were done and a radio-meteorgraph, or a radiosonde, was developed. It was very crude, but it transmitted data to a manually operated ground tracking site in real time. In the late 1930s the National Weather Service established a network of radiosonde sites that continue to this day.

After World War II, scientists developed and tested rockets to measure this data high into the atmosphere. This program, although limited, continues today.

Many changes have occurred in the instrument tracking of the program since World War II. The earliest was the switch from manual tracking to automatic tracking, with tracking equipment upgraded in both capability and responsiveness. The latest change was the nationwide switch from using an automatic direction finder system to track the flight to using GPS satellites to track the flight path, with as many as ten satellites used in the tracking process. This has resulted in a much more accurate measurement of wind data throughout the flight.

The meteorological data portion has also undergone extensive change. The instruments have decreased in size from shoe box size weighing a pound or more to a 3X5 box weighing only a few ounces. The largest portion of the weight attributed to the water-activated batteries, which will soon be replaced with lithium batteries.

Once launched, the data is radioed back to the launching site where it is processed. In the 50s and 60s it took two people about three hours to receive, evaluate, plot and compute the data received. The next improvement was to use one person to process the data, and send it via phone line to a time share computer system (anywhere in the world). This gave way to a mini computer system replacing the time share system, but the observer still needed to process the data entered into the computer. The next step was to use a computer to ingest, process, evaluate, and compute the data. After this was accomplished, the data was automatically transmitted worldwide in real time.

Finally, the GPS system arrived in the early years of the 21st century. Now the balloon is released ending the observer's role in the data collection except to quality control the data received. From the 50's and 60's with two observers and three hours to process the data, we have gone to one observer and one and a half hours to accomplish the same task. Additionally, the observer is able to perform other duties during the flight.

The RFC and WFO, along with the National Operational Hydrologic Remote Sensing Center (NOHRSC), teamed up with the local Boy and Girl Scout councils for the second straight year to host "Scout Day" in October. Nearly 300 boy and girl scouts from the local area visited the NOAA facility to participate in six activity stations which helped them earn their weather badge. Each scout also had an opportunity to launch a balloon during a special weather balloon release. The participants posed for a picture just before the launch, seen below.

Weather balloon release at second annual "Scout Day"

Fire Weather Services

The Chanhassen NWS office provides forecast service to support Land Management Agencies who conduct prescribed burns and fight wildfires. Our routine forecast service consists of twice-daily Fire Weather Planning Forecast narratives, typically issued from March through November. We also issue numerical forecasts for four forecast points. This information provides input for wildland fire management agencies to assess current fire danger at local levels.

In 2008 our office issued a record 270 Spot Forecasts tailored for individual prescribed burns conducted by Federal Agencies and the Minnesota and Wisconsin Department of Natural Resources. These forecasts provide very specific weather information pertaining to the precise location where the burn will take place. Most of these forecasts are issued in April and May when the majority of prescribed burns take place.

In dry weather, during times of high winds and low relative humidity, we issue Red Flag Warnings to alert land managers of increased wildfire potential. Red Flag Warnings were issued on two days in April and May.

One of our forecasters is also an Incident Meteorologist (IMET). When dispatched, he works as part of the Incident Management Team suppressing wildfires or managing other incidents. In 2008 he worked on incidents for 20 days. These included a 16 day dispatch to the Great Dismal Swamp Fire in Southeast Virginia during the month of July.

The Chanhassen office also provided weather support during the Republican National Convention in September. In addition to support from the home office in Chanhassen, the IMET provided on-site weather support at the Initial Operations Facility located in the U.S. Army Reserve Building at Fort Snelling. Duties included several weather briefings each day for Federal, State, and local law enforcement agencies and FEMA officials, as well as maintaining a constant weather watch for the local area.

The Fire Weather Program Leader in Chanhassen also assists Land Management agencies in fire weather training courses for wildland firefighters.

For further information, contact Byron Paulson at Byron.paulson@noaa.gov.

Verification: Probability of Precipitation

Verification is the final but critical part of the National Weather Service forecast process. It is "seeing the forecast through". How meteorologists performed on their forecast allows for the opportunity to see where improvement has occurred or may be needed.

One of the forecasts we verify is probability of precipitation (POP). The concept of POP forecasting is something the NWS has used for decades. The definition of POP is the forecast office's likelihood that measureable precipitation (0.01 inch or higher) will occur at a given location during the forecast period. The given location used is a 5km by 5km grid point which is the forecasting resolution level invoked by all NWS offices. The time period for the forecast can vary, however for verification purposes it is considered 12 hours in duration from 6 am-6 pm and 6 pm-6 am CST.

Probabilistic forecasts work well for weather as the state of the science still does not allow for pin-point precision in precipitation forecasting, especially greater than three days in advance. POP forecasting was developed and continues to be issued for decision-making customers to weigh the forecast confidence in the chance for precipitation versus their impact threshold. NWS probabilistic forecasts also include river stages and stream flow as well as climate forecasts and may someday be issued for all weather and hydrologic elements.

Probability of Precipitation Issued By NWS Chanhassen in *2008*

Forecast Issued	Precipitated This Amount of the Time	% Error
0-10%	7%	2%
20%	19%	1%
30%	29%	1%
40%	38%	2%
50%	48%	2%
60%	58%	2%
70%	69%	1%
80%	72%	8%
90%	81%	9%
100%	78%	22%

The table to the left reflects verification for our forecast POP during 2008. These are for nine communities within our forecast area and for each day and night in the seven day forecast for two daily forecast issuances. Thus, this includes tens of thousands of forecasts. Verification such as this helps our meteorologists to see when they may have a bias for too low or high POP forecasting.

New Faces

The 2008 calendar year and the first months of 2009 brought many new faces to the RFC and WFO in Chanhassen. These new scientists and technicians have already assisted in forward strides of the office in their early Chanhassen tenure. Six of the eight people had previous NOAA experience, ranging from Alaska, to Georgia, to Louisiana, and many other places. The new very talented folks are:

- Diane Cooper – *Service Hydrologist, WFO*
- Scott Dummer – *Hydrologist in Charge, RFC*
- Dustin Goering – *Hydrologic Forecaster, RFC*
- Mike Griesinger – *Meteorologist, WFO*
- Rich Hebert – *Technician, RFC*
- James Taggart – *Meteorologist, WFO*
- Jonathon Thornburg – *Hydrologic Forecaster, RFC*
- Dean Warren – *Technician, WFO*

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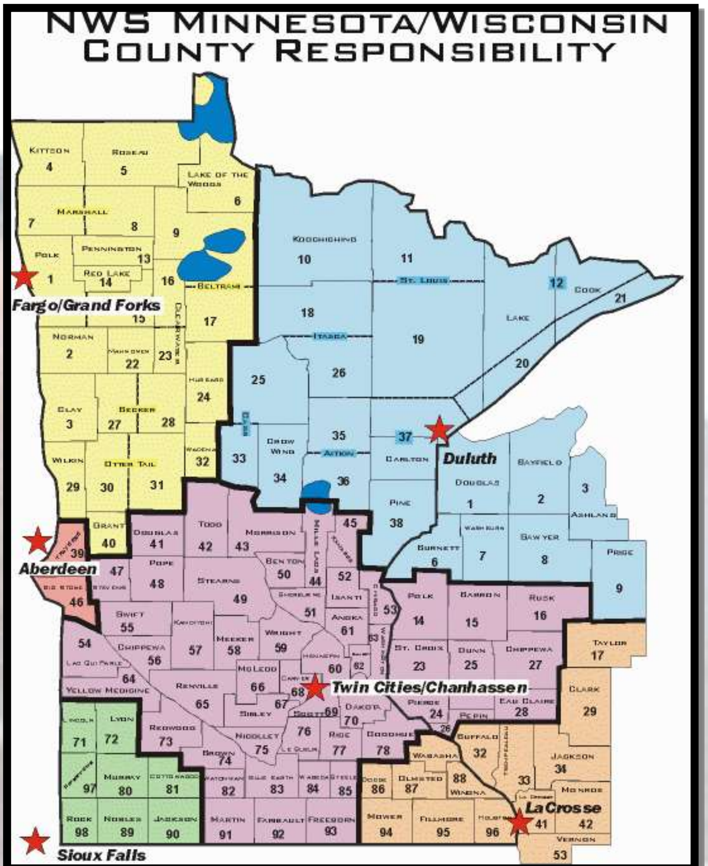

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